Western Health and Social Care Trust



Limitations of Orthodontics and Why Mechanics May go Wrong

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- Consultant Orthodontist at Altnagelvin Hospital
  - 3 days/week
  - Complex cases referred by specialist practice
  - Part time experienced Orthodontic therapist
  - Dental Core Trainee
- Specialist practice
  - 2 days /week
  - GDP clinical assistant

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Aims and Objectives

- Understand importance of accurate diagnosis and treatment planning in delivery of orthodontic care
- Understand biological limits of orthodontic treatment planning and what can be achieved with fixed and removable appliances
- Explain how to recognize when treatment is not progressing as planned and how is this managed

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Successful treatment



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Successful treatment

Correct Diagnosis
- Skeletal
- Dental
- Soft tissue
- Habits
- Age

Correct treatment plan
- Interceptive
- Growth modification
- Camouflage
- Anchorage
- Extraction v non extraction
- Surgery

Patient factors
- Facial
- Dental
- Functional
- Cost/time/ pain
- Compliance/ treatment adherence

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Limiting factors

- Nature of the malocclusion
  - Skeletal
  - Dental
- Size of the discrepancy
- Degree of Dentoalveolar compensation
- Age of the patient- future growth prediction
- Effects of treatment modality
- Compliance
- Stability

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Orthodontic Diagnosis

- Assessing patient against 'norms'
- Normal

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Diagnosis

- **Extraoral**
1. Antero-posterior (AP)
2. Vertical
3. Transverse
4. Lips
5. Smile

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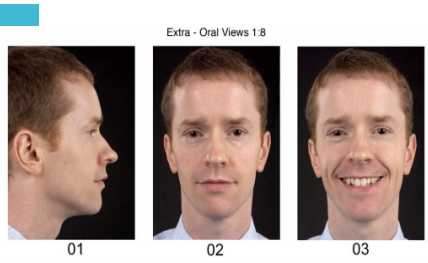
Extra oral



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Natural head posture



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Examples



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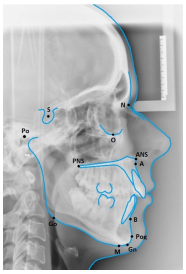
Cephalometric



	Degrees
SNA	81+/-3
SNB	78+/-3
ANB	3+/-1
UI/MX	109+/-6
LI/MD	93+/-6
MMPA	27+/-4

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Examples



ANB	3+/-1	>4	<2

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Vertical Skeletal pattern



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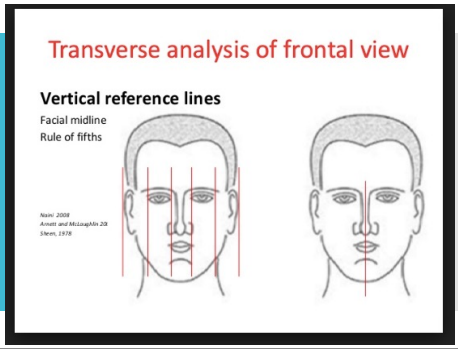
Symmetry



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Mandibular asymmetry



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Lips



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Smiles-
Incisor show



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Intraoral



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In occlusion

- Molars
- Incisor
- Overjet
- Overbite
- Crowding
- Centrelines
- Crossbites

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Molar
relationships



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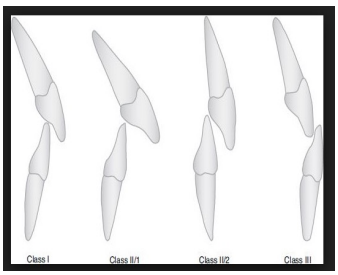
Incisor
relationships



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Class II/1



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Class II/2



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Class III incisors



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Overbite



Normal 2-4mm or 1/3 -1/2 tooth

Increased

Decreased



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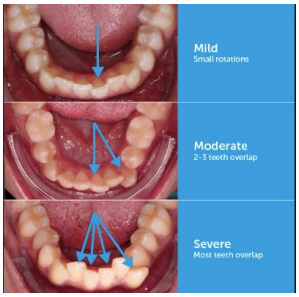
Crowding



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Limiting factors

- Nature of the malocclusion
  - Skeletal
  - Dental
- Size of the discrepancy
- Degree of Dentoalveolar compensation

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Dentoalveloar compensation DAC

- Dental alveolar compensation refers to the natural adjustment of teeth and their supporting bone to maintain a proper bite (occlusion) despite underlying skeletal jaw discrepancies.
- This process involves changes in the position and angulation of teeth, as well as the growth of the alveolar bone, to create a functionally harmonious dental arch that compensates for mismatches in jaw relationships.
- It's a mechanism that tries to camouflage skeletal issues by altering the dentition, which can be temporary or a long-term adaptation.

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DAC

Natural adaptation of teeth and their supporting alveolar bone to camouflage a significant skeletal jaw discrepancy,

Skeletal 2	Skeletal 3
Retroclining upper incisors	Proclining upper incisor
Proclining lower incisors	Retroclining lower incisors

- Treatment planning assesses how much more DAC is possible and will that camouflage the underlying skeletal malocclusion

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DAC

Why Compensation is Important

Camouflaging the Discrepancy:

Dentoalveolar compensation helps to create the appearance of a more balanced facial profile by masking the underlying skeletal discrepancy.

Limited Correction:

If there is extensive compensation already present, it may limit the extent of possible orthodontic correction.

Maintaining Stability:

The goal is to achieve a stable and harmonious occlusion by working with the existing compensation, aiming for optimal facial aesthetics and function.

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Limitations for different Malocclusions

How much tooth movement can I achieve?

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Envelope of tooth movement

- Graphic representation of the potential tooth displacement achievable with orthodontic treatments
- Helps determine if case can be treated by camouflage, growth modifications or surgery
- 3 envelopes
  - Inner- no change to skeletal
  - Middle – possible with growth modification
  - Outer – orthognathic surgery

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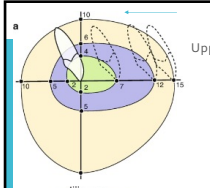
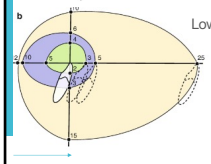


Upper incisors

	Backwards	Forwards
Inner – ortho only	7mm	2mm
Middle – growth mod	12mm	5mm
Outer - surgery	15mm	10mm



Lower incisors

	Backwards	Forwards
Inner – ortho only	3mm	5mm
Middle – growth mod	5mm	10mm
Outer - surgery	25mm	12mm

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Management of Increased Overjet /SK2

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Increased Overjet/ SK2

Diagnosis
- Facial concerns/ dental concerns
- Nature of malocclusion
  - Skeletal
  - Dental
- Amount of dental alveolar camouflage
- Age of patient – growth potential
- Soft tissue factors- lips
- Habits
- Compliance
- Stability

Treatment options
- Interceptive
- Growth modification
- Camouflage
- Orthognathic surgery

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Class II/1 Malocclusions

- Interceptive treatment
- Growth modification
- Orthodontic camouflage
- Orthognathic surgery

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Increased overjet
Interceptive treatment
Digit sucking

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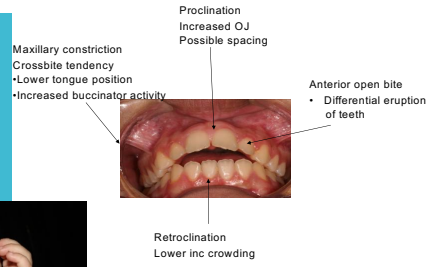
Effects of digit sucking





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Interceptive Appliances

- Ultimately, the child has to be ready to stop and want to stop the habit.
- Rarely <10yrs



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Increased overjet/SK2
Growth modification

CASES

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Effects of Twinblock (TB) growth modification

- GROWING PT- Ideally prepubertal growth spurt
- **25% skeletal change**
  - Accelerates mandibular growth
  - Does not increase end size of mandible
- **75% dental change- DAC**
- Dental change
  - Retocline upper incisors
  - Procline lower incisors

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Growth modification

12yr old
Class II/1
No habits
lip trap

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VARIABLE	PRE-TREATMENT	NORMAL
SNA	83°	81° ± 3
SNB	75°	78° ± 3
ANB	8°	3° ± 1
Upper incisor to maxillary plane angle	117°	109° ± 5
Lower incisor to mandibular plane angle	88°	92° ± 5
Interincisal angle	115°	133° ± 10
Maxillo-mandibular planes angle	40°	27° ± 5

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VARIABLE	PRE-TREATMENT	POST-FUNCTIONAL	CHANGE
SNA	83°	82°	-1°
SNB	75°	77°	+2°
ANB	8°	5°	-3°
UI/MX	117°	110°	-7°
LI/MD	88°	103°	+15°

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Monitoring TB treatment

- SPEECH
- APPLIANCE WEAR
- OVERJET
- REVERSE OJ
- MOLAR RELATIONSHIP
- INCISOR RELATIONSHIP

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Failed TB growth modification

16yrs old male
Compliance (25% Failure TB)



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VARIABLE	PRE-TREATMENT	NORMAL
SNA	83°	81° ± 3
SNB	76°	78° ± 3
ANB	7°	3° ± 1
Upper incisor to maxillary plane angle	120°	109° ± 5
Lower incisor to mandibular plane angle	90°	92° ± 5
Interincisal angle	115°	133° ± 10
Maxillo-mandibular planes angle	34°	27° ± 5

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Carriere Motion Appliance



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After CMA





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Camouflage

DAC with extractions

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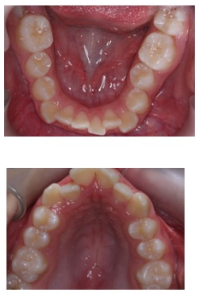
Space requirements

Lower arch
- 6mm crowding
- Extract
- LR5 LL5

Upper arch
- 9mm OJ
- 4mm crowding
- Xbite correction



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Anchorage

Anchorage: The sites that provide resistance to the reaction generated by the forces applied to move certain teeth.

- **Extra-oral**: anchorage obtained from outside the oral cavity, usually head/neck.
- **Intra-oral**: anchorage provided by the teeth or other oral structures. If the anchorage is provided by the same jaw= intramaxillary, opposing jaw= intermaxillary.
- **Reciprocal anchorage**: mutual anchorage of 2 teeth or 2 groups of teeth to be moved. The relative movement of each group will depend on the numbers and root surface areas (and types of movements).

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Anchorage

- Goals of anchorage management:
  - an optimum level of force exits after which there is no increase in rate of tooth movement just increase strain on anchor units.
  - Aim to minimise strain on anchor unit

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Anchorage reinforcement

Anchorage= space management:

1.maximise intended tooth movement

2. Minimise unwanted tooth movement.

- Extraction pattern

- Anchorage reinforcement
  - **Skeletal anchorage-Temporary anchorage devices**
  - Intermaxillary anchorage - elastics
  - TPA/NANCE

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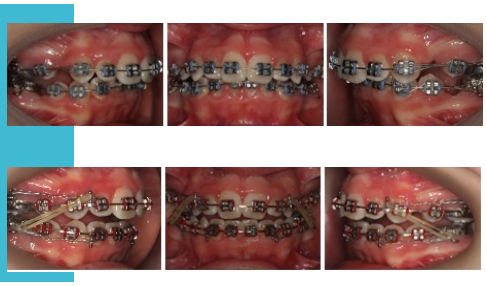

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VARIABLE	PRE-TREATMENT	3 MONTHS PRE-DEBOND	CHANGE
SNA	83°	82°	-1°
SNB	75°	75°	0°
ANB	8°	7°	-1°
UI/MX	116°	109°	-7°
LI/MD	88°	91°	+3°
MMPA	31°	31°	0°

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Sk2 when DAC is not possible

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Limits of DAC

- UI are already retroclined
- LI already proclined
- Pt still has OJ
- Pt has facial concerns
- Pt has stopped growing

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Orthognathic

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Skeletal
ANB 8
UI 105
LI 103
No further DAC possible

Growth completed

Treatment plan
1. Decompensation of DAC
2. MANDIBULAR ADVANCEMENT SURGERY

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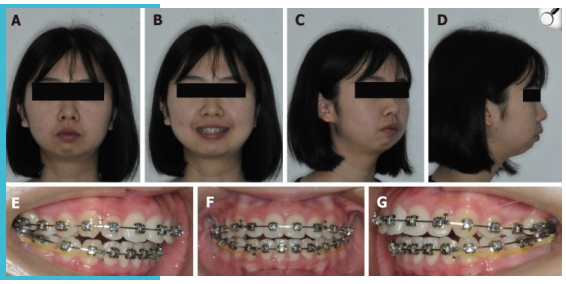

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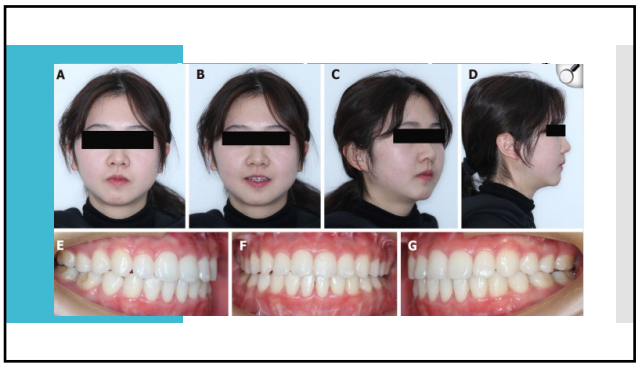

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Management of sk3 / reverse overjet

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Reduced OJ Overjet/ SK3

Diagnosis
- Facial concerns/ dental concerns
- Nature of malocclusion
  - Skeletal
  - Dental
- Amount of dental alveolar camouflage
- Age of patient – growth potential
- Soft tissue factors- lips
- Habits
- Compliance
- Stability

Treatment options
- Interceptive
- Growth modification
- Camouflage
- Orthognathic surgery

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Interceptive

Class III inc sk1
URA to procline



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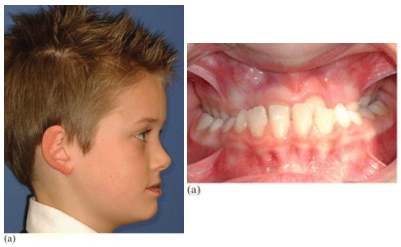
Class III treatment- growing patient



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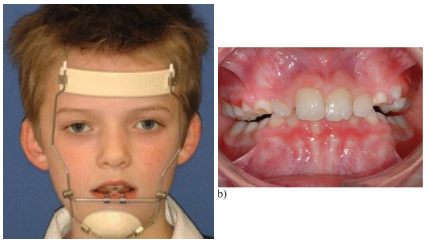
Proclines UI



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Class III camouflage DAC

Factors to consider

1. Severity of skeletal malformation
2. Amount of dental Alveolar compensation
   - UI inclination
   - LI inclination
3. Can pt achieve Edge to edge
4. Amount of incisor show at rest
5. Facial concerns

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Camouflage DAC

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Referred case




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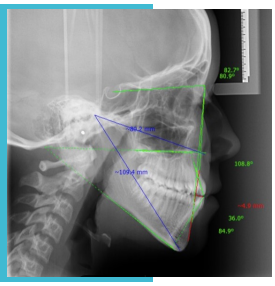

What went wrong?
- SNA 82.7
- SNB 81
- ANB 1.7
- UI 108
- LI 85
- Crowding space requirements miss calculated

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Impact of Class III DAC on incisor show



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Orthognathic

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Limits of DAC

- UI are already proclined
- LI already retroclined
- Pt still has ROJ
- Pt has facial concerns
- Pt has stopped growing

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Case selection



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- Previous orthodontics attempted- prob UFA only
- UI proclined
- LI retroclined
- Still ROJ
- Facial concerns

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Overbites – deep bite cases

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Growth modification

- Anterior bite plane/ Bite turbos
- Posterior disocclusion
- Posterior eruption
- Overbite correction

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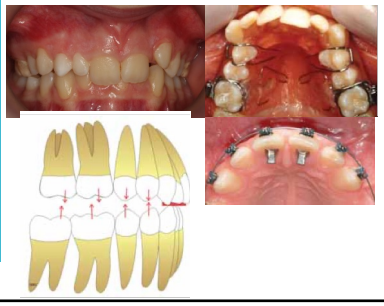
Deep bite treatment – growing patient



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Deep bite treatment- growing patients



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Levelling curve of spee (reverse curve niti)



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Deep bite treatment- adult patient



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Surgery – deep bite



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Posterior crossbites

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Limiting factors

- Nature of the malocclusion
  - Dental
  - Skeletal
- Degree of Dentoalveolar compensation
- Size of the discrepancy
- Age of the patient
- Type of appliance
- Compliance
- Stability

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Interceptive

- Grinding of deciduous canines

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Posterior crossbites

- Maxillary growth stops age 12-14yrs (girls 12 ; boys 14)

Options:

1. URA screw -1-2mm no/minimal DAC
2 quad helix –crossbite <4mm no/minimal DAC
3. Rapid maxillary expansion 4-7mm no/minimal DAC
4. Surgery -> 8mm and DAC

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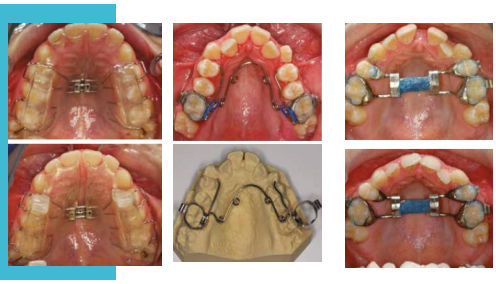

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Other examples treatment not progressing

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Impacted canines – adult patient





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Doesn't move



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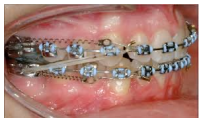
Failure of orthodontic space closure

Sliding mechanics





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Failure of orthodontic space closure

Sliding mechanics

- Is extraction space decreasing
- Ensure no 'kinks' in wire - **Binding**
- Is excess wire out the back of molar tube
- Are there occlusal interreferences to space closure- *HAS OVERBITE BEEN REDUCED*
- Are you using excessive force- *Hyalinization*
- Is there a tooth size discrepancy
  - Are you going to compromise of posterior interdigitation
  - Are you going to build up small teeth

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Things I do to improve success

- Place a pop-up with date of bond up
- Ensure each visit the treatment has progressed in some way
  - Helps if you are measuring at least one aspect
    - Gold chain loop
    - Size of extraction space
    - Wire out
- If no progression for x2 visits reassess my mechanics
  - Is same bracket/module breaking
  - What can I do? Alternatives?

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Operator factors limiting treatment outcomes

- No. of operators/ transfer of case mid tx
- Experience of operator with treatment
- Experience at recognizing failures/problems
- Quality /quantity of supervision

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Patient factors

- Diet and OH
- Attendance
- Breakages
- Compliance/ adherence

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How to improve patient compliance

- Motivate your patient- positive v negative drivers
- Involve parents/guardians
- Diaries/Alarms
- Virtual monitoring- INVISALIGN

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Questions

- Share with the group any ideas you have to improve patient compliance

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Orthodontic therapist and Special needs patients

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Identify patients with special needs

What is special needs?

A special needs child is a child with a disability, learning difficulty, or medical condition that makes it harder for them to learn or participate in typical activities, requiring additional support and care.

This term often encompasses conditions affecting cognition, communication, learning, or physical and emotional health.

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Avoid having sterotypes in mind

Mild/ moderate

- Like all children, children with additional needs are all different
- They may find treatment difficult at the start
- They have the ability to adapt and accept treatment

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Pre - attendance

- We are often not aware prior to first visit
  - Parents often contact prior to first attendance if they feel their child has specific needs or they want more info to prepare their child
- Medical qu specifically asking about special needs
- Once identified you should determine if the care pathway needs to be adapted
  - Additional resources to prepare child
  - They may have a 'care passport' which can help you

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Waiting

- Consider booking at less busier times
- Keep areas quieter
- Keep up to date if you are running late

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Being seen

- Ideally same operator in same room
- May need to attend just to see environment
- Give short clear instructions
  - Care use resources such as 'social stories' to prepare
- Avoid confusion
- Likely require more appointments although shorter
- May wish to speak to parent away from child; arrange a call

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Dealing with Parent expectations

- May have to modify/ compromise/ treatment outcomes
- Parents know their child and it is very rare they insist on unrealistic treatments
- In some cases even trying and failing gives parents time to accept some treatments are not in their child's best interest

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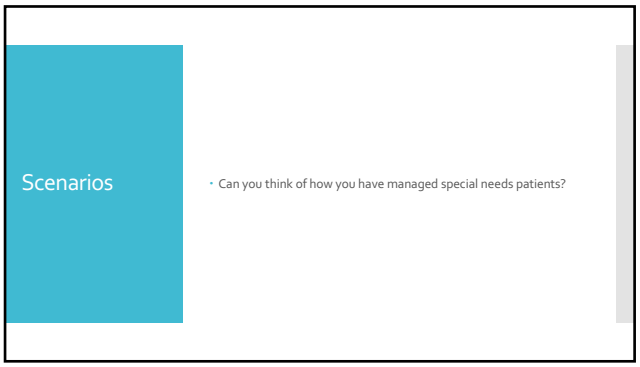
Scenarios
Can you think of how you have managed special needs patients?

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